Influence of Body-Tied and Floating-Body Structure in Double Gate Vertical n-MOSFET

Abstract:

The body-tied, BT DGVMOS and floating-body, FB DGVMOS devices have become an alternative solution for controlling short channel effects (SCEs). The influence of both structures in Double-Gate Vertical MOSFET (DG VMOS) will affect the device performance. For this purpose, both device structures, body-tied and floating-body DG VMOS have been developed and analytically compared by using Silvaco TCAD simulation tools. The simulations made for various substrate concentrations, Nsub(9×1017, 5×1017 and 1×1017cm-3) to be varied with different channel length, Lg (90, 50, and 30 nm). The electrical characteristic and SCEs of Threshold Voltage, Vth, Drain Induced Barrier Lowering (DIBL), Sub-threshold Swing (SS), and Current Ratio (Ion/Ioff) for both proposed device structures were investigated. According to TCAD simulation results, these respective results have been achieved, 20 mV/V of DIBL, and more than 107Ion/Ioff current ratio. The excellent subthreshold swing (~60 mV/dec) of the BT DGVMOS device is also attractive and it offers better electrical characteristics and thus improves the short channel effects (SCEs) compared to the FB DGVMOS device. Hence, it is believed that the BT DGVMOS device can become of the candidates for future nanoscale device.